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MEASUREMENT OF STATE ANXIETY IN CHILDREN IN HOSPITAL:

PSYCHOMETRIC PROPERTIES OF THE STATE-TRAIT ANXIETY INVENTORIES

BY

TANIS SCHISLER

©

A THESIS SUBMITTED TO THE FACULTY OF

GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF NURSING

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FALL, 1995

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled, **Measurement of State Anxiety in Children in Hospital: Psychometric Properties of the State-Trait Anxiety Inventories**, in partial fulfillment of the requirements for the degree of Master of Nursing.

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Date: May 4, 1995

Abstract

The focus of this project is the state anxiety of children facing hospitalization or invasive medical procedures. The first of two papers in this document reviews factors affecting anxiety in children undergoing invasive medical procedures. The role of these factors is unclear, because research has been hampered by a lack of valid measurement instruments. The second paper describes an investigation of psychometric properties of two state anxiety measurement tools: State-Trait Anxiety Inventory for Children (STAIC) and State-Trait Anxiety Inventory, Form Y-1 (STAIY). 883 subjects (aged 5-18) completed the age appropriate tool following surgery or prior to pain-provoking procedures. Findings provided limited support for the construct validity of the STAIC but none for the STAIY. Analyses identified many poor items (STAIC=8; STAIY=6) which affected the reliability and validity of both tools. The STAIC and STAIY are not recommended for use in this population.

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Overview of Thesis Project

The purpose of this overview is to summarize and integrate the parts of the thesis project. The focus of this research was state anxiety experienced by children who were facing hospitalization or invasive medical procedures. This document consists of three separate sections: the overview and two manuscripts. One manuscript presents a literature review and the second is a report of original research undertaken.

Background

A review of background information about factors affecting state anxiety in children is presented in the first manuscript in this document (pages 8 to 35). In that manuscript anxiety is described as a multi-dimensional phenomenon consisting of cognitive, affective, behavioural and neurophysiological components. Two distinct forms of anxiety have been identified. These are trait and state anxiety. Trait anxiety is a relatively stable personality trait, while state anxiety is a transient response to perceived threats. (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983).

Children commonly undergo invasive procedures as part of the prevention, diagnosis and management of illness. For some children these experiences serve as valuable opportunities to learn how to cope successfully with stress (Menke, 1981). Others may experience overwhelming anxiety resulting in the development of a variety of somatic and behavioural symptoms. In some cases, anxiety related to a specific situation may be generalized to all

health services and health professionals, possibly resulting in avoidance behaviours (Dolgin, Katz, Doctors & Siegel, 1986; Katz, Kellerman & Siegel, 1981; Martin, Shaw & Taylor, 1977).

A number of factors appear to be related to anxiety, such as, stage of cognitive and psychosocial development, nature of previous experiences, and strategies used for coping. Yet the exact nature of these relationships remain largely unknown. The occurrence of anxiety precipitated by health care and invasive medical procedures is also unknown. In fact, very little applied research has been conducted about children's experiences of anxiety in health care environments.

Research on this topic has been hampered by the absence of a consistent definition of anxiety and of a theoretical framework which depicts the relationships between anxiety and other variables. Another major factor has been the lack of reliable and valid instruments to measure children's anxiety in health care environments.

Researchers in this region recently conducted three studies in which the pain and anxiety of children in hospital environments was examined.[1] Anxiety was assessed with the State-Trait Anxiety Inventory ,Form Y-1 (abbreviated as

---

[1] The three studies were:
a) Post-operative Pain, Distress and Anxiety in Children (J. Lander & S. Fowler-Kerry (Funded by National Health Research Development Program)
b) Evaluation of EMLA: Effects on Pain Response (J. Lander, E. Friesen, J. McTavish, S. Nazarali, & J. Ouellette), (Funded by Central Research Fund & Alberta Heritage Foundation for Medical Research)
c) Medically Induced Pain and Pain Alleviation in Children (J. Lander & S. Fowler-Kerry) (Funded by Alberta Foundation for Nursing Research).

STAIY) (Spielberger, Gursuch, Lushene, Vagg & Jacobs, 1983) and the State-Trait Anxiety Inventory for Children ,Form C-1, (abbreviated as STAIC) (Spielberger, Edwards, Montuori & Lushene, 1973).

The STAIY and STAIC are both 20 item, self-report tools. The STAIC was developed for use with elementary school children although it has been used with subjects as young as those in kindergarten (Spielberger et al., 1973; Papay & Spielberger, 1986). The STAIY is a revision of an earlier form (STAI Form X) and was developed for use with high school students and adults (Spielberger et al., 1983). While evidence supports the reliability and validity of these tools in educational settings, there is no evidence supporting their reliability and validity when used in health care settings.

Two observations were made by the researchers about the STAIY and STAIC. They noticed that children did not complete all items and that several items seemed to confuse many children. These observations prompted a search of the literature. No communications were found about item-related problems. Moreover, there was a lack of evidence supporting the reliability and validity of the STAIY and STAIC when used in this population. Given the vital need for tools to measure state anxiety in children receiving health care a project was designed and undertaken to assess the STAIY and STAIC. The report of this research is presented in the second manuscript (pages 36 to 61).

Data from the three investigations done in this region were available for secondary analysis. Appendix A contains a summary of the three studies

including purposes, inclusion/exclusion criteria and data collected. Secondary analyses of these data were feasible because: original data sets, code books, protocols and instruments were available; researchers were available to provide additional information and; data were of high quality.

The objectives of this thesis project were to examine the STAIY and STAIC in order to:

- assess internal consistency reliability;
- identify problem items;
- identify factors related to item-omission;
- assess convergent validity, and;
- compare percentile ranks and mean STAIY and STAIC scores (broken down by gender, and age) with those Spielberger et al., (1973: 1983) obtained for students in normal classroom situations.

The results of analyses can be summarized as follows. Eight STAIC and six STAIY items were identified as problematic for children based on their high frequency of omission, or low corrected item-total or inter-item correlations. Many of the item problems were related to poor readability and/or invalidity of the items as measures of state anxiety.

Alpha coefficients were high but misleading as they included only the 60% (STAIC) and 72% (STAIY) of subjects who completed all items. Correlations between STAIY and STAIC scores and the anxiety portion of the Children's Anxiety and Pain Scale (CAPS) (Kuttner & LePage, 1989) were

moderately positive.

Subject's mean scores on the STAIY and STAIC were higher than those Spielberger et al. (1973; 1983) obtained for subjects in normal classroom situations but the differences were small. Given that clinical observations suggest hospitalized children have fairly high state anxiety, this finding called into question the sensitivity of the tools.

In seeking evidence of construct validity percentile ranks for STAIC and STAIY scores obtained in this study were plotted against those of students in normal classroom situations (Spielberger et al. 1973; 1983). For each score STAIC percentile ranks for children in hospital were, as expected, lower than those of students (indicating higher levels of anxiety). This pattern was also evident among the higher range of STAIY scores. However, among the lower range of STAIY scores percentile ranks for subjects were unexpectedly higher than those of students. This suggests the STAIY may be less sensitive at lower anxiety levels.

Additional information relating to the research is located in the appendices. Appendix B contains tables displaying corrected item-total and inter-item correlations and percentile ranks for the STAIY and STAIC as well as a table presenting the criteria for classification of problem items.

Several conclusions can be offered as a result of the research described in this document. One is that the anxiety experienced by children in health care settings has been under-researched. While there are no data about the

incidence or severity of children's anxiety in these environments, clinical observations suggest that the problem may be extensive. Further research is needed about the incidence and severity of anxiety, influencing factors, as well as interventions for alleviating anxiety.

Second, the findings of this study do not support the reliability and validity of the STAIY and STAIC when used with children in hospital and/or undergoing invasive medical procedures. Finally, a multitrait-multimethod approach to studying anxiety in this population is recommended. Ongoing evaluation of the psychometric properties of other state anxiety measurement tools is essential. Without evidence supporting the validity of the tools the validity of our research must be questioned.

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Factors Affecting State Anxiety in

Children Undergoing Invasive Procedures

Factors Affecting State Anxiety in Children Undergoing Invasive Procedures

Each year millions of children are hospitalized and millions more receive health care in out-patient clinics (McCerthy & Kozak, 1985). In the diagnosis, treatment or prevention of illnesses, many children must endure invasive and potentially painful procedures such as injections, venipunctures, dental restorations, and surgeries. For some children these procedures evoke only mild anxiety and serve as valuable opportunities for learning to cope with stress (Davenport & Werry, 1970; Menke, 1981; Vernon, Foley & Schulman, 1967). However, for others they evoke extreme anxiety and can have profound, short and long term deleterious effects such as: the development of nightmares, behaviour problems, somatic disturbances, negative responses to medical interventions in general and global anxiousness about health care (Goslin, 1978; Menke, 1981; Rae, 1981; Siegel, 1976; Thompson, 1985).

The state anxiety experienced by children undergoing invasive procedures and the factors which affect it are the focus of this paper. Following a general discussion of the concepts anxiety, state anxiety and trait anxiety, problems and limitations of current research in this area will be outlined. Following this, a review of the literature pertaining to intrapersonal and extrapersonal factors affecting children's state anxiety will be presented.

Anxiety

While the term anxiety is used widely in the literature it is often used uncritically, reflecting diverse definitions (Edelmann, 1992). One common thread among its many definitions is that anxiety is a response to perceived danger (Whitley, 1992).

Anxiety is generally viewed as a complex phenomenon involving affective, cognitive, behavioural and neurophysiological components (Edelmann, 1992). The affective component involves unpleasant subjective feelings such as worry, nervousness, apprehension, dread and tension; while the cognitive component involves changes in thinking, knowing, judging and/or learning (for example, altered concentration and problem solving abilities). The behavioural component involves a variety of observable motor behaviours such as frequent posture changes or rigidity. Autonomic nervous system responses (for example, increased pulse and respiratory rate, dilated pupils, decreased blood pressure, vomiting and increased plasma catecholamines and corticosteroids) represent the neurophysiological component (Lader, 1980). The exact nature of the relationships among these four components has not been determined, although it appears that the relationships are complex, and that they vary within the individual, over time, and within a given situation (Knight et al., 1979; Melamed, Siegel, & Ridley-Johnson, 1988; Zeltzer & LeBaron, 1986).

The term anxiety is often used in reference to two related but distinct concepts: state anxiety and trait anxiety. State anxiety is viewed as a transient

response to perceived threats. Trait anxiety refers to relatively enduring, individual differences in anxiety proneness, that is, to the tendency to perceive and respond to situations as if they were threatening (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983). As the focus in this paper is state anxiety, the term anxiety will refer to state anxiety only.

Difficulties Associated With Anxiety Research

Three factors make the study of children's anxiety in clinical settings particularly difficult. The first is the absence of a theoretical framework depicting the relationship between anxiety and other causal variables. In addition, the lack of consensus about the unique nature of anxiety has led to interchanging of the terms anxiety, fear and distress (Finch & McIntosh, 1990; Fradet, McGrath, Kay, Adams & Luke, 1990), although these concepts are arguably distinct (Whitley, 1992; Wells, 1990). Where these terms have been used interchangeably, the interpretation of research results is problematic.

The second factor is that it is unethical to manipulate anxiety in children who are unable to provide informed consent. Because experimental manipulation is therefore seldom possible, research about causal relationships between anxiety and other variables has been limited.

The third factor relates to the quality of the instruments available for measuring children's anxiety. A number of observational, self-report and neurophysiological measures have been utilized in assessing children's anxiety but, evidence supporting their reliability and validity is generally not available.

Furthermore, most tool developers failed to take into account children's varying developmental levels. Yet, children's anxiety responses may be in part, dependent on their level of development. (Broome & Endesley, 1987; Faust & Melamed, 1984; Gonzalez et al., 1989; Johnson, Kirchhoft & Endress, 1975; Katz et al., 1982).

Despite the aforementioned difficulties, investigators have attempted to study anxiety in children undergoing a variety of invasive procedures such as: injections, venipunctures, electromyography and nerve conduction studies, bone marrow aspirations, lumbar punctures, surgery, and dental restorations. (Lander, Fowler-Kerry & Oberle, 1992; Melamed, Dearborn & Hermecz, 1983; Reissland, 1983; Schneider & LoBiondo-Wood, 1992; Zeltzer & LeBaron, 1982). They have examined both the manifestations of anxiety, as well as its relationships with a variety of intrapersonal and extrapersonal variables. However, many of these studies had methodological weaknesses, such as, the use of small convenience samples (Broome et al., 1992) and a lack of control of observer bias and other confounding variables (Venham, Murray &, Gaulin-Kremer, 1979). In addition, many failed to operationalize anxiety in a way that made it distinct from pain (Katz, Kellerman & Siegel, 1980; Zeltzer & LeBaron, 1982).

Intrapersonal Factors Affecting Anxiety

There are a number of intrapersonal factors which are thought to influence anxiety. These factors include age, maturity, coping style and strategies, gender, locus of control, temperament, and previous experience.

Age

Young children undergoing invasive procedures tend to express their anxiety in a vocal and physically active manner. At age six or seven, they begin to exhibit fewer behavioural indicators of distress (Hilgard & LeBaron, 1982; Jay et al., 1983; Jay, Katz, Elliott & Siegel, 1987; Katz et al., 1980; Smith, Ackerson & Blotcky, 1989; van Aken, van Lieshout, Katz & Heezen, 1989; Winer, 1982). In comparison adolescents tend to exhibit greater physical self-control, express their anxiety in more subtle behaviour such as, flinching and groaning, and have fewer emotional outbursts (Katz et al., 1980; LeBaron & Zeltzer, 1984). Adolescents may exhibit less overt distress as a result of greater impulse control and a more realistic understanding of the need for the procedure (Jay et al., 1983).

While younger and older children differ in their behavioural manifestations of anxiety there is no evidence that they differ in the intensity of their experienced anxiety (LeBaron & Zeltzer, 1984; Winer, 1982). Investigators who have reported age differences in anxiety used observational tools that were age-biased (Katz, Kellerman & Siegel, 1980). A greater behavioural response should not be equated with greater anxiety (Broome, Lillis, McGahee & Bates, 1992; Hilgard, & LeBaron, 1982; Winer, 1982). For example, LeBaron and Zeltzer (1984) reported that one child undergoing bone marrow aspiration cheerfully jumped on the table and then became rigid and screamed throughout the procedure. Later, the boy reported his overall distress as low and explained

that his screaming provided a distraction which helped reduce his subjective perception of distress.

Maturity

Because of the developmental changes which occur during childhood, any discussion of anxiety must take into account children's level of emotional, psychosocial and cognitive maturity. McGrath and Craig (1989) suggested that children's psychosocial skills and their ability to manage their emotions improve with age, however, neither the nature of these changes nor their relationship with anxiety have been determined.

Children's conceptualizations and interpretations of invasive procedures and their resultant reactions, including anxiety, are based in part on their cognitive maturity (Browne, O'Keefe, Sanders & Baker, 1986; Riessland, 1983). For example, cognitively immature persons, may not comprehend the necessity of a procedure and view it as punishment (Lynn, 1986). They may also be unable to consider factors such as the duration of the procedure (which might modify anxiety), and focus instead on the immediately visual aspects of the procedure, and on their pain (Eland & Anderson, 1977; Peterson, 1989).

There are developmental changes in children's conceptual understanding of physical illness, pain and fear. Children's understanding of physical illness and pain appear to evolve in a predictable and non-gender-specific way, which is consistent with Piaget's Theory of Cognitive Development (Brewster, 1982; Burbach & Peterson, 1986; Gaffney & Dunne, 1986, 1987; Harbeck & Peterson,

1992; Susman, Dorn, & Fletcher, 1987). Piaget's theory describes the maturation of children's thought processes from simple and concrete with an egocentric focus to complex, abstract reasoning with an increased awareness of others. Cognitive immaturity may result in a number of illness or treatment related misconceptions (Lynn, 1986) which as Siegel, Smith and Wood (1991) proposed, may contribute to higher levels of anxiety.

The number and nature of children's fears as well as their overall fearfulness also varies with developmental stage (Bauer, 1976; Reed, Carter & Miller, 1992). There is one exception: Children's fears of physical injury, doctors, dentists and surgery appear to remain constant across all developmental stages (Lapouse & Monk, 1959; Miller, Barrett & Hampe, 1974).

Coping Style and Strategies

Coping refers to the cognitive and behavioural activities utilized to manage a perceived stressful situation (Lazarus & Folkman, 1984). Coping responses vary across persons, times and situations, which makes its study inherently difficult (Peterson, 1989). Investigation of coping in children is further complicated by their rapid physiological, cognitive, emotional and psychosocial developmental changes (Peterson, 1989; Riessland, 1983). Because of these difficulties, relatively little is known about the acquisition and nature of children's coping styles and strategies.

While the pediatric literature about coping styles of children facing invasive procedures is limited, a small subset of studies has provided consistent

results. These studies described two types of coping styles: a) an active information-seeking style of coping in which children sought information about the procedure and b) an avoidant or information-denying style in which children did not attend to the procedure (Broome et al., 1990; Burstein & Meichenbaum, 1979; Field, Alpert, Vega-Lahr, Goldstein & Perry, 1988; Knight et al., 1979; Peterson & Toler, 1986; Shipley, Butt & Horowitz, 1979; Shipley, Butt, Horowitz & Farby, 1978). Children who actively sought information tended to experience less anxiety. However, interpretation of this finding is problematic. It may be that the seeking of information reduced children's anxiety but, it is equally possible that it was the children who were initially less anxious who were able to focus attention beyond themselves and to seek information.

The types of coping strategies employed by children may also vary depending on their stage of cognitive development. Reissland (1983) found that younger children undergoing tonsillectomies utilized more behavioural coping strategies (such as playing a game or calling their mother), whereas older children were able to use both behavioural and cognitive coping strategies (such as imagery and asking questions). Whether these cognitive and behavioural strategies are differentially effective in reducing anxiety is unknown.

Gender

Contradictory findings have been reported about gender differences in children's anxiety. Several researchers have reported no gender differences (Dahlquist et al., 1986; LeBaron & Zeltzer, 1984). Others found that females

admitted more fears and anxieties than same-age males and that they differed in the focus of their concerns (Bamber, 1974; Kirkpatrick, 1984; Ollendick, 1983; Orton, 1982). Still others found that girls tended: to cry, scream and verbally stall more; to express greater verbal anxiety; and to need more restraint than same-age boys (Katz et al., 1980; Hilgard & LeBaron, 1982). Van Aken et al., (1989) found that prior to, but not during, a bone marrow aspiration the number of distress behaviours displayed declined at an earlier age for boys than for girls. It is unknown whether these observed gender differences are a reflection of unreliable and/or invalid observational and self-report tools, or if they indicate real differences due to biologic differences or to early conditioning within the children's sociocultural environments.

Locus of Control

According to Locus of Control Theory, individuals vary in the extent to which they believe events are contingent on their actions (internal locus of control) or dependent on forces outside their control (external locus of control) (Goertzel & Goertzel, 1991). While research of this topic is limited, some researchers have reported a low positive correlation between external locus of control and anxiety in healthy children aged 9 to 12 years (St. Yves, Dompierre, Freeston, Jacques & Malo, 1989). Further research is needed to establish the exact nature of the relationship between locus of control and children's anxiety.

Temperament

Children's temperament may also affect how they respond to invasive

procedures (Chess & Thomas, 1986; Melamed, Siegel & Ridley-Johnson, 1988; Wallace, 1989). Temperament refers to one's unique consistent behavioural style or emotional reactivity. McClowry (1990) conducted a study in which mothers of hospitalized children (aged 8 to 12 years) rated their children's temperaments. She found that temperament accounted for some of the variability in the children's behaviour.

Past Experiences

There are conflicting findings about the association between anxiety and previous experience with the invasive procedure. Some researchers reported that children's distress was unrelated to the number of previous experiences (Dahlquist et al., 1986; Fradet et al., 1990; van Aken et al., 1989). Others reported that children's distress diminished with repeated exposure to the stressor (Jacobsen, et al., 1990; Jay et al., 1983). Still other investigators reported a positive relationship between amount of experience and children's distress (Katz et al., 1980; Kellerman et al., 1983; Shaw, 1975; Wright & Alpern, 1971).

It may be that it is the quality of these past experiences that is the critical factor rather than quantity of exposure. For example, children who have previously experienced negative medical procedures demonstrate more behavioural distress than children with previous positive or neutral experiences (Dahlquist et al., 1986).

Extrapersonal Factors

Factors outside the child may also influence their anxiety. These extrapersonal factors include parental presence/absence, parents' own anxiety and parent generated interventions and pain as well as several other variables.

Parents' Behaviour

Parental presence/absence

There is conflicting evidence about the effect of the presence or absence of the parent on the child's anxiety during an invasive procedure. In some studies, children whose parents were present during the procedures exhibited more behavioural distress such as, crying, aggression and resistance than did children with absent parents (Shaw & Routh, 1982; Dahlquist et al., 1986; Gross et al., 1983). In other investigations, parental presence was associated with less behavioural distress (Frankl, Shiere and Fogels, 1962; Vernon et al., 1967: Hannallah & Rosales, 1983). Another study found no relationship between parental presence/absence for younger children receiving an injection (Gonzalez et al., 1982). An unexpected finding of the latter study was that older children exhibited more behavioural distress when the parent was present.

Two explanations have been offered to explain children's increased behavioural distress when parents are present. The first is that parents serve as discriminative stimuli for the exhibition of distress behaviours (Shaw & Routh, 1982). The second is that children may be as distressed or more distressed when the parent is absent, but inhibit any outward expressions fearing reprimand

or additional procedures (Gonzalez et al., 1989). Explanations for the contradictory findings have not been offered. It seems likely that it is the effect of the nature of the dynamic interaction between mother and child that influences children's anxiety, rather than merely the presence or absence of the parent. Examination of the nature of these parent-child interactions and their effect on children's anxiety has just begun.

Parents own anxiety

Emotional Contagion Theory posits that parental anxiety is communicated to the child through nonverbal and verbal mechanisms, and that increases in the parent's anxiety result in increases in the child's anxiety (Jacobsen et al., 1990). This theory has acquired some support in medical situations. For example, parent and child anxiety were moderately positively correlated in a number of studies involving children undergoing invasive procedures (Bush et al., 1986; Hays et al., 1992; Jay et al., 1983; Manne, Jacobsen & Redd, 1992; Sexton, Mournino & Brownstein, 1993; Wright & Alpern, 1971; Wright, Alpern & Leake, 1973). In addition, in some studies where strategies were used to reduce parental anxiety, decreases in parental anxiety were associated with decreases in children's behavioural distress. However, these latter findings have not been replicated in other studies (Ridley-Johnson, Tracy & Mulling, 1984; Wolfer & Visintainer, 1979; Wright et al., 1973).

The parent's general emotional health may also affect the child's anxiety. A positive relationship has been reported between parental trait anxiety and

children's behavioural distress (Jay et al., 1983). Children experiencing difficulty in adjustment during hospitalization are more likely to have mothers experiencing emotional distress (Bush et al., 1986; McClowry, 1988; Thompson, 1985). Observational learning of fears from parents and siblings has been documented, although the extent to which it occurs is unknown (Bandura & Menlove, 1968; Solyom, Beck, Solyom & Hugel, 1974).

The relationship between parent's and child's anxiety remains largely unknown despite research on this topic (Melamed, Siegel & Ridley-Johnson, 1988). Research findings may be interpreted in three ways: (a) children may use their parents as references for interpretation of events around them, (b) children may model their parents' distressed behaviour, or (c) parents may be responding to their children's distress (Mabe, Treiber & Riley, 1991).

Parent generated interventions

Studies exploring the relationship between specific parental behaviours (such as providing distraction, admonishment and reassurance) during the procedure and children's behavioural distress have provided disparate results. Blount, Sturges and Power (1989), who videotaped the behaviours of parents and children undergoing bone marrow aspiration or lumbar puncture, found that the parental use of distraction was related to fewer distress behaviours. Conversely, Jacobsen et al. (1990) found that for 70 children undergoing venipuncture, parental distraction was not related to the degree of child distress. In both studies several possible confounding variables were not controlled and

this may account for the contradictory results.

Broome and Endesley (1989) found that neither parental admonishing nor encouraging behaviours were related to the degree of children's distress with injections. Others have reported that the use of parental reassurance (behaviours facilitating the child's emotional expression) was associated with increased distress (Blount et al., 1989; Bush et al., 1986; Weinstein, Getz, Ratener & Domoto 1982; Zabin & Melamed, 1980). However, Bush et al. (1986) found that parental reassurance in combination with facilitation of active coping (such as distraction and informing) was associated with less child distress. Bush et al. (1986) also observed that younger children were more likely to receive maternal reassurance when they showed distress, and that the mother and younger child's behaviours were more interdependent. Interpretation of these findings is problematic as researchers used different operational definitions of certain parent behaviours and utilized small convenience samples drawn from different populations.

It has also been proposed that parents' child-rearing practices are associated with children's anxiety during dental and medical procedures (Venham, Murray, Gaulin & Kremer, 1979; Zabin & Melamed, 1980). To date, however, empirical evidence explicating this relationship is not available.

Pain

Two opposing views have been put forth on the nature of the relationship between pain and anxiety. Proponents of the Gate Control Theory of Pain

suggest that anxiety intensifies the experience of pain (Chapman & Turner 1986; Melzack, 1973). A different view is that anxiety and pain are mutually exclusive, anxiety activating the individual to prepare for action (fight or flight), and pain deactivating the individual in order to promote healing (Bolles & Fanselow, 1980).

Research findings do not endorse either of these simplistic views of the pain-anxiety relationship. In some studies, correlations between pain and anxiety were positive but moderate (Broome et al., 1990; Lander, Hodgins & Fowler-Kerry, 1992; LeBaron & Zeltzer, 1984). In others, correlations between pain and anxiety were either negative or nonsignificant (Chaves & Brown, 1987; Kent, 1984, 1985; Wardle, 1984). Unreliable or invalid tools may account for these inconsistent findings. A more likely explanation is that the relationship between pain and anxiety is complex, that indirect causal pathways exist between the two, and that current measurement instruments are limited in their ability to measure all dimensions of the relationship.

Other Extrapersonal Factors

It has been proposed that the duration and severity of the child's illness, the difficulty of the procedure, characteristics of the health care worker, preparation of the child, and child's ethnicity may also affect anxiety. For children undergoing bone marrow aspiration or lumbar puncture, no relationship was observed between their level of distress and either the severity of their medical conditions or the duration of their illnesses (Jay et al., 1983; Katz et al.,

1980). Jacobsen et al. (1990), found that health care professionals' ratings of the difficulty of venipuncture were positively related to children's distress scores.

Specific characteristics of the health care worker may also be related to children's anxiety. For example, the origin of some adult dental fears has been traced to childhood experiences with unpleasant or frightening dentists (Klepac, Dowling & Hauge, 1982; Lautsch, 1971; Liddell & May, 1984).

Preparation for invasive procedures appears to have differential effects on children's anxiety. The provision of preparatory information, including modelling, was associated with increased anxiety in children who had previously been exposed to the procedure, but, with decreased anxiety for those naive to the procedure (Faust & Melamed, 1984; Klorman, Hilpert, Michael, LaGana & Sveen, 1980; Melamed et al., 1983).

There is no compelling evidence to suggest that ethnicity affects anxiety. Differences in the expression of anxiety are assumed to occur as a result of socialization processes such as observational learning and corrective feedback (Weisenberg, 1984).

Conclusions

In conclusion, although many factors appear to affect the state anxiety experienced by children undergoing invasive procedures, the exact nature of these relationships are largely unknown. It is evident that state anxiety is a complex, subjective experience and that current measurement tools have not yet brought it fully into the realm of objective measurement. Eventually, more

sophisticated tools must be developed which can capture the complexity of state anxiety. At present, it is recommended that multiple measurement methods be simultaneously used to explore the various components of anxiety (affective, cognitive, behavioural and neurophysiological), as well as their relationships to a wide range of factors. Moreover, evidence to support or refute the reliability and validity of the tools utilized must be obtained and reported.

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Psychometric Assessment of the STAIC (A-State) and STAI (A-State) for Children in Hospital.

Abstract

This study involved psychometric assessment of State-Trait Anxiety Inventory for Children (STAIC) and State-Trait Anxiety Inventory, Form Y-1 (STAIY). Subjects were in hospital for surgery or blood testing (n=883, 5-18 years). Psychometric analyses led to identification of eight STAIC and six STAIY problem items. Alpha reliability coefficients were high but misleading as calculations excluded 315 subjects who omitted items. Mean scores and percentile ranks were compared with published data on children's state anxiety in the classroom. Hospitalized children had greater state anxiety than school children (STAIC only) lending support for construct validity. There was a lack of evidence of reliability for both tools and validity for the STAIY. Considering all the evidence together, it was concluded that the tools are not reliable or valid in this population.

Psychometric Assessment of the STAIC (A-State) and STAI (A-State) for Children in Hospital.

Anxiety, which is a common human emotion, has two distinct forms. One is a stable characteristic or personality trait (trait anxiety) and the other a transient response to perceived threats (state anxiety). Medical procedures carried out in the course of prevention, diagnosis and management of illness can be perceived as threatening and are, therefore, common sources of state anxiety, particularly for children (Kuttner, Bowman & Teasdale, 1988; Melamed, Siegel & Ridley-Johnson, 1988). State anxiety associated with anticipating medical procedures may be so severe that it leads to nausea, vomiting, insomnia, nightmares and/or skin rashes (Dolgin & Katz, 1988; Katz, Kellerman & Siegel, 1981). Moreover, the phenomenon of state anxiety induced by medical procedures can generalize so that anxiety is evoked by all health services and health professionals (Dolgin, Katz, Doctors & Siegel, 1986; Katz, Kellerman & Siegel, 1981; Martin, Shaw & Taylor, 1977). In time, this cycle may result in avoidance behaviours.

The rate of occurrence of children's state anxiety associated with invasive medical procedures is unknown. In fact, little applied research has been conducted on children's state anxiety as it relates to illness and health care. A major factor hampering research in this area is the lack of valid instruments to measure state anxiety. Two instruments that have potential utility in this population are the state anxiety forms of the State-Trait Anxiety Inventory Form

Y-I (abbreviated as STAIY) (Spielberger, Gorsuch, Lushene, Vagg & Jacobs, 1983) and the State-Trait Anxiety Inventory for Children, Form C-1 (abbreviated as STAIC) (Spielberger, Edwards, Montuori & Lushene, 1973). Both the STAIY and STAIC are 20-item, self-report tools.

The STAIY was developed for use with high school students and adults. Developers presented evidence for reliability but not validity when completed by 10th-grade students (Spielberger et al., 1983). Alpha reliability coefficients for 10th-grade students were high (≥.86), and test-retest stability coefficients were low to moderate (.34 to .62). The latter finding is consistent with the notion that state anxiety is transient in nature.

The STAIC was developed to measure anxiety in elementary school children. There is some support for its reliability and construct validity. Alpha reliability coefficients for American children in kindergarten through grade 6 ranged from .71 to .82 (Papay & Hedl, 1978; Papay & Spielberger, 1986; Spielberger et al., 1973) and test-retest stability coefficients from .31 to .47 (Spielberger et. al, 1973). Construct validity was assessed by having subjects first complete the tool using standard directions and then as they imagined they would respond just before a final exam. Mean scores on the STAIC were higher in the imagined exam condition than with the standard instructions (Spielberger et al., 1973).

Notwithstanding this evidence, a tool that has been developed for use in a certain context may not be psychometrically sound when used for different

populations and in different times and settings (Waltz, Strickland & Lenz, 1991). While the STAIY and STAIC have been administered to children in health care environments there is no convincing evidence in the literature supporting their reliability and validity in this population. The purpose of this study therefore, was to evaluate the psychometric properties of the STAIY and STAIC for children in hospital and/or undergoing invasive procedures.

The specific objectives of this investigation were: to evaluate the internal consistency of the STAIY and STAIC; to identify potential problem items; to determine convergent validity and; to compare mean STAIY and STAIC scores and percentile ranks (broken down by gender, age) with those published by Spielberger et al. (1973; 1983).

Method

Subjects

Subjects, who numbered 883 in total, were drawn from three aggregates. The first aggregate consisted of 111, 5 to 16 year-old in-patients who were recruited from two tertiary care hospitals in City A. All were hospitalized for emergent appendectomy.

The second aggregate consisted of 258 children aged 5 to 18 years, who were in- or out-patients in a hospital also in City A. A total of 118 had been admitted to the day surgery unit (for less than 12 hours) and were scheduled for intravenous cannulation immediately prior to surgery. The remaining 140 children were recruited from both in-patient and out-patient environments

(laboratory, medical and pre-admission clinics) and were scheduled for venipuncture for blood testing.

The third aggregate consisted of 514 children (aged 5 to 16 years) who attended an out-patient laboratory in a tertiary care hospital in City B. They were scheduled for venipuncture for blood testing. Table 1 summarizes sample characteristics by aggregate.

Subjects and their parents were fluent in English in all aggregates. The socioeconomic environments of City A and B were similar. Data from Census Canada (1991) confirmed they were alike in terms of age, educational level, family income and unemployment rate. Table 2 contains information about the two cities which supports the appropriateness of combining the data obtained from the three aggregates.

Instruments

The state anxiety portions of the State-Trait Anxiety Inventory for Children (A-state, Form C-1) (Spielberger et al., 1973) and the State-Trait Anxiety Inventory (A-State, Form Y-1) (Spielberger et al., 1983) were used. The anxiety portion of the Children's Anxiety and Pain Scale (CAPS) (Kuttner & LePage, 1989) was also utilized in aggregate III. This tool consists of a set of five sketched faces, which are neither gender nor age specific, and which range from no anxiety to extreme anxiety. Children and parents were asked to choose the face which best represented the child's feelings about having a needle. The CAPS has been used with children aged 4 to 10 years but evidence of its validity

Table 1

Sample Characteristics by Aggregate

Characteristics	Aggregate			
	I	II	III	Combined
Sample size	111	258	514	883
Gender				
Males	50 (45.1%)	127 (49.2%)	264 (51.4%)	441 (49.9%)
Females	61 (54.9%)	131 (50.8%)	250 (48.6%)	442 (50.1%)
Mean age in years (SD)	12.1 (2.8)	12.4 (3.7)	11.3 (3.4)	11.7 (3.4)

Table 2

Socioeconomic Characteristics of Cities A and B

Characteristic	City A	City B
Age		
% Total population < 15 years	23.7	24.4
% Total population ≥ 15 years	76.3	75.6
Highest level of schooling of those ≥15 years		
% < grade 9	8.0	9.3
% High school	38.5	36.3
% Post secondary with or without certificate	40.3	40.1
% University with degree	13.2	14.3
Unemployment		
% of total labour force unemployed- age ≥ 25	7.4	7.5
Average family income-all census families	$52,967	$48,732

Note. Unemployed refers to those without work but actively seeking it and available for work, those on layoff but expected to return to their jobs and/or those who had definite arrangements to start a new job within four weeks. (Source: Census Canada Profile 2B, 1991)

has not been reported.

Procedure

Potential subjects were assessed to determine if they met inclusion criteria. If so, they were approached and informed consent was obtained from parents and subjects prior to data collection.

Test manual guidelines for STAIY and STAIC administration (Spielberger et al., 1973; 1983) were followed with each aggregate. Research assistants read instructions to all children under nine years of age. Items were pronounced but not defined if subjects asked for item clarification. Those under 14 years were given the STAIC and those 14 or older the STAIY. Where subjects had known developmental or reading problems, the STAIC was administered rather than the STAIY. In total, the STAIY was administered to 311 subjects and the STAIC to 572.

The timing of the administration of the STAIY and STAIC varied with the sample aggregates. In aggregate I, the STAIY and STAIC could not be administered until after a period of recovery from the surgery and anaesthetic. While many subjects had surgery in the evening and were sufficiently alert to complete the tools the next mid-day, those seriously ill (from perforated appendices) did not complete the STAIY or STAIC until one or two days following surgery. The mean time from surgery until STAIY or STAIC administration was 23 hours (SD = 11.1).

In aggregates II and III, the STAIY and STAIC were administered

immediately prior to the arrival of the health care worker who performed the scheduled procedure. The CAPS was administered after the STAIY or STAIC for aggregate III only. Children were asked to choose the face which illustrated their response to having a needle. Parents were asked to select the face which best represented the amount of anxiety their child experienced when having venipuncture. Parent and child were not together when these ratings were made.

Results

Data Preparation

Data were coded, stored and then examined for completeness and accuracy. All subsequent analyses were conducted separately for the STAIY and STAIC (as the instruments are unique and do not produce equivalent scores). Distributions were inspected and descriptive statistics obtained for all variables.

It was determined that 53 subjects did not complete the age-recommended STAIC or STAIY. Ten subjects over 14 years were given the STAIC because of developmental delay or established poor reading skills. Another 43 subjects were administered the STAIY although they were less than 14 years. Half of these subjects (n = 22) were close to their fourteenth birthday. The other 21 (who were 11 to 13 years) were given the STAIY in error, sometimes intentionally, because the research assistant believed the subject had advanced reading skills. Two of the 21 subjects omitted more than two items. Spielberger et al., (1973; 1983) advised that if subjects omit more than

two items their scores on the STAIY and STAIC should be considered invalid. Because these two subjects were both given the incorrect instrument and had invalid scores, they were dropped from analyses. This reduced the sample size to 881. The remaining 41 subjects who were under 14 years and omitted $\leq$2 STAIY items were retained.

Data from subjects who omitted more than two STAIY or STAIC items were included in all analyses except those involving the STAIY and STAIC scores. Sample sizes for analyses involving STAIY and STAIC scores were thus reduced to 298 (STAIY) and 517 (STAIC). Table 3 presents characteristics of subjects (split on the basis of STAIY and STAIC).

The number of items omitted by subjects was positively skewed for both the STAIY and STAIC with <10% omitting more than two items. This variable was therefore coded as a categorical variable with four levels (Items Omitted: 0, 1, 2, or >2).

STAIC and STAIY: Frequencies of Item-omission

The number of items omitted ranged from 0 to 19 for the STAIC and 0 to 8 for the STAIY. All 20 STAIC items were completed by 60% (n = 344) of subjects and all STAIY items by 72% (n = 222). The frequency distribution for number of items omitted can be found in Table 4.

Table 5 presents the STAIY and STAIC items ranked by frequency of Jittery was omitted most frequently on the STAIC whereas indecisive was omitted most often on the STAIY.

Table 3

Sample Characteristics by STAIC and STAIY

Characteristic	STAIC	STAIY
Gender		
Male	306 (53.5%)	134 (43.4%)
Female	266 (46.5%)	175 (56.6%)
Mean age in years (SD)	9.7 (2.4)	15.4 (1.3)
N	572	309

Table 4

Frequency of Number of Items Omitted by STAIC and STAIY

No. items omitted	STAIC	STAIY
0	344 (60.1%)	222 (71.8%)
1	123 (21.5%)	60 (19.4%)
2	50 (8.7%)	16 (5.2%)
3	19 (3.3%)	6 (1.9%)
4	13 (2.3%)	3 (1.0%)
5	10 (1.7%)	1 (0.3%)
6	3 (0.5%)	0 (0.0%)
7	3 (0.5%)	0 (0.0%)
8	1 (0.2%)	1 (0.3%)
11	1 (0.2%)	0 (0.0%)
15	4 (0.7%)	0 (0.0%)
19	1 (0.2%)	0 (0.0%)
N	572	309

Table 5

STAIC and STAIY: Rank-ordering of Items by Frequency of Omission

STAIC		STAIY	
Item	Frequency of Omission	Item	Frequency of Omission
Jittery	158 (27.6%)	Indecisive	64 (20.7%)
Satisfied	78 (13.6%)	Content	14 (4.5%)
Pleasant	54 (9.4%)	Strained	12 (3.9%)
Terrified	37 (6.5%)	Steady	12 (3.9%)
Sure	35 (6.1%)	Jittery	8 (2.6%)
Calm	29 (5.1%)	Satisfied	7 (2.3%)
Troubled	17 (3.0%)	Worrying	4 (1.3%)
Bothered	14 (2.5%)	At ease	3 (1.0%)
Relaxed	13 (2.3%)	Upset	3 (1.0%)
Rested	12 (2.1%)	Self confident	3 (1.0%)
Nice	12 (2.1%)	Relaxed	3 (1.0%)
Cheerful	12 (2.1%)	Worried	1 (0.3%)
Nervous	11 (1.9%)	Pleasant	1 (0.3 %)
Mixed up	11(1.9%)	Calm	0 (0.0%)
Upset	9 (1.6%)	Secure	0 (0.0%)
Frightened	7 (1.2%)	Tense	0 (0.0%)
Worried	7 (1.2%)	Frightened	0 (0.0%)
Scared	1 (0.2%)	Comfortable	0 (0.0%)
Good	1 (0.2%)	Nervous	0 (0.0%)
Happy	0 (0.0%)	Confused	0 (0.0%)
N	572		309

Factors Related to Item-omission

No significant gender differences were observed in number of items omitted for either the STAIC or STAIY (Chi-square analyses). While analysis of variance revealed a significant difference in STAIC item-omission by age, the assumption of homogeneity of variance was violated (Levene Test). The analysis was repeated using Kruskal-Wallis ANOVA and a significant difference was confirmed (Chi-square = 51.3, df = 3, p < .001): Younger subjects omitted more items than older ones. Mean ages of subjects omitting 0, 1, 2, and >2 items were 10.2, 9.6, 8.9, and 8.0 years respectively.

A significant difference was also found in the number of STAIY items omitted by age (ANOVA; $F(3,305) = 3.0$, p =.03). Post hoc tests (Scheffe) did not reach significance. Mean ages of subjects omitting 0, 1, 2 and >2 items were 15.4, 15.1, 14.9, and 15.0 years respectively.

Internal Consistency

To assess the internal consistency of the STAIY and STAIC and to identify problem items, alpha reliability coefficients, corrected item-total correlations, and inter-item correlations were computed. Alpha reliability coefficients obtained in this study were compared with those calculated by Spielberger et al., (1973; 1983). Accordingly, they were computed in the same way as those of Spielberger, that is, for males and females separately. Alpha reliability coefficients for males and females who completed the STAIC were .90 (males: n = 183) and .91 (females: n = 161) and for the STAIY .91 (males: n =

100) and .94 (females: n = 122). Items with corrected item-total correlations of ≤ .50 were then excluded and alpha reliability coefficients re-computed. The alpha coefficient for males who completed the STAIC was .90 (n = 197, item: n =16) and for females .90 (n = 229, items: n = 14). The alpha coefficient for males who completed the STAIY was .92 (n = 119, items: n = 15) and for females it was .95 (n = 150, items: n = 17). Sample sizes were larger when the coefficients were re-computed because elimination of items with low correlations resulted in a greater number of STAIY and STAIC with zero omitted items which could enter into the computation.

Corrected item-total correlations were also examined. STAIC items with corrected item-total correlations ≤.50 ($p < .05$) were Rested, Satisfied, Pleasant, Sure, Mixed-up and Terrified. STAIY items with corrected item-total correlations ≤.50 ($p < .05$) were Confused, Indecisive and Worrying.

In order to identify problem items Pearson inter-item correlations were computed. For the STAIC, 27 of the Pearson inter-item correlations were ≤.20 ($p < .05$). Two others were near zero and nonsignificant. Frequencies with which items were involved in the 29 low correlations were examined. The items most frequently involved were Satisfied and Rested (each involved in 10 of the low inter-item correlations) and Pleasant (in 4).

For the STAIY, 17 of the Pearson inter-item correlations were ≤.20 ($p < .05$) and 3 others were near zero and nonsignificant. Items most frequently involved in these 20 low correlations were Confused (involved in 10 correlations)

and Indecisive (involved in 7).

High item omission, low corrected item-total correlations and low inter-item correlations were three criteria for classification of a problem item. Eight STAIC and six STAIY items were identified. Three of the identified items met all criteria (Satisfied, Pleasant, Indecisive); seven met two criteria (Jittery, Terrified, Sure, Rested, Mixed up, Confused, and Worrying) and four met one criterion (Calm, Content, Strained, Steady).

Convergent Validity

In seeking evidence for convergent validity, correlations were computed between STAIY and STAIC scores and two other anxiety measures (that had been collected only in aggregate III). Pearson correlations between STAIY and STAIC scores and subjects' self-reported anxiety with venipuncture, as measured by the CAPS, were .62 (STAIY: $p < .001$, $n = 167$) and .55 (STAIC: $p < .001$, $n = 313$). Pearson correlations between parents' CAPS ratings (of subjects' venipuncture anxiety) and subjects' STAIY or STAIC scores were .39 (STAIY: $p < .01$, $n = 167$) and .45 (STAIC: $p < .01$, $n = 313$).

STAIC and STAIY Scores

Subjects' STAIC scores were not significantly different by age group (9 levels; 5 through 13 years of age) (Kruskal-Wallis ANOVA), nor were STAIY scores significantly different by age group (6 levels; 13, through 18 years of age) (ANOVA).

While no significant differences were observed in STAIC scores by

gender, analysis of variance revealed significant differences in STAIY scores by gender ($F(1, 294) = 11.7$, $p < .001$). The mean STAIY score for females was 40.2 ($SD = 12.8$, $n = 128$) and for males was 36.1 ($SD = 10.3$, $n = 170$).

Three distinct environments were identified among the three sample aggregates. Some children were hospitalized several days or more for appendectomy ($n = 111$), some had day surgery (short stay, but not over night ($n = 118$), and some made out-patient clinic visits to a physician ($n = 92$). There were no significant differences in STAIY or STAIC scores by environment (ANOVA).

In seeking evidence for construct validity, STAIY and STAIC scores and percentile ranks for scores obtained in this study were compared to those obtained by Spielberger et al. (1973; 1983) for subjects in normal classroom settings. Hospitalized children facing painful procedures should have greater anxiety than students in normal classroom situations and a valid tool should detect these differences. If percentile rankings are identical, then the tool does not discriminate differences in anxiety for different populations. A plot of the percentile rankings of scores for Spielberger against those from this study would produce a 45 degree diagonal line beginning at zero if the rankings are identical.

As rawscores of every possible value were not obtained, only those obtained in both this study and in Spielberger's were included in the plots. The percentile rank for each available rawscore from Spielberger was plotted against the corresponding percentile rank from this study. Males' and females' scores

were analyzed separately to correspond with Spielberger's published data. Data from subjects aged 9 to 11 and 15 years were employed in these analyses to conform with Spielberger's published data for grades 4 to 6 and grade 10 (grade 4 = 9 years of age, grade 5 = 10 years, grade 6 = 11 years, grade 10 = 15 years).

Figure 1 illustrates that percentile ranks for STAIC scores in this study were higher than those of students. The plots of STAIY percentile ranks form an S-curve over the 45 degree diagonal (Figure 2). Therefore, for high levels of anxiety, the STAIY discriminates school anxiety from hospital anxiety. At moderate and low levels of anxiety, the STAIY is unable to discriminate.

Mean STAIY and STAIC scores for male and female subjects in this study are presented in Table 6 with Spielberger's published data. Children in hospital had higher STAIC mean scores but lower STAIY mean scores compared to students.

Discussion

A main finding of this study is that the the STAIY and STAIC contain a number of poor items, including, Indecisive, Content, Strained, Steady, Confused and Worrying (STAIY) and Jittery, Satisfied, Pleasant, Terrified, Sure, Calm, Rested, and Mixed up (STAIC). These poor items compromise the validity of the STAIC and STAIY.

Several explanations may account for the poor items. These relate to tool readability (for example syntax and outdated items); attributes of the reader

Table 6

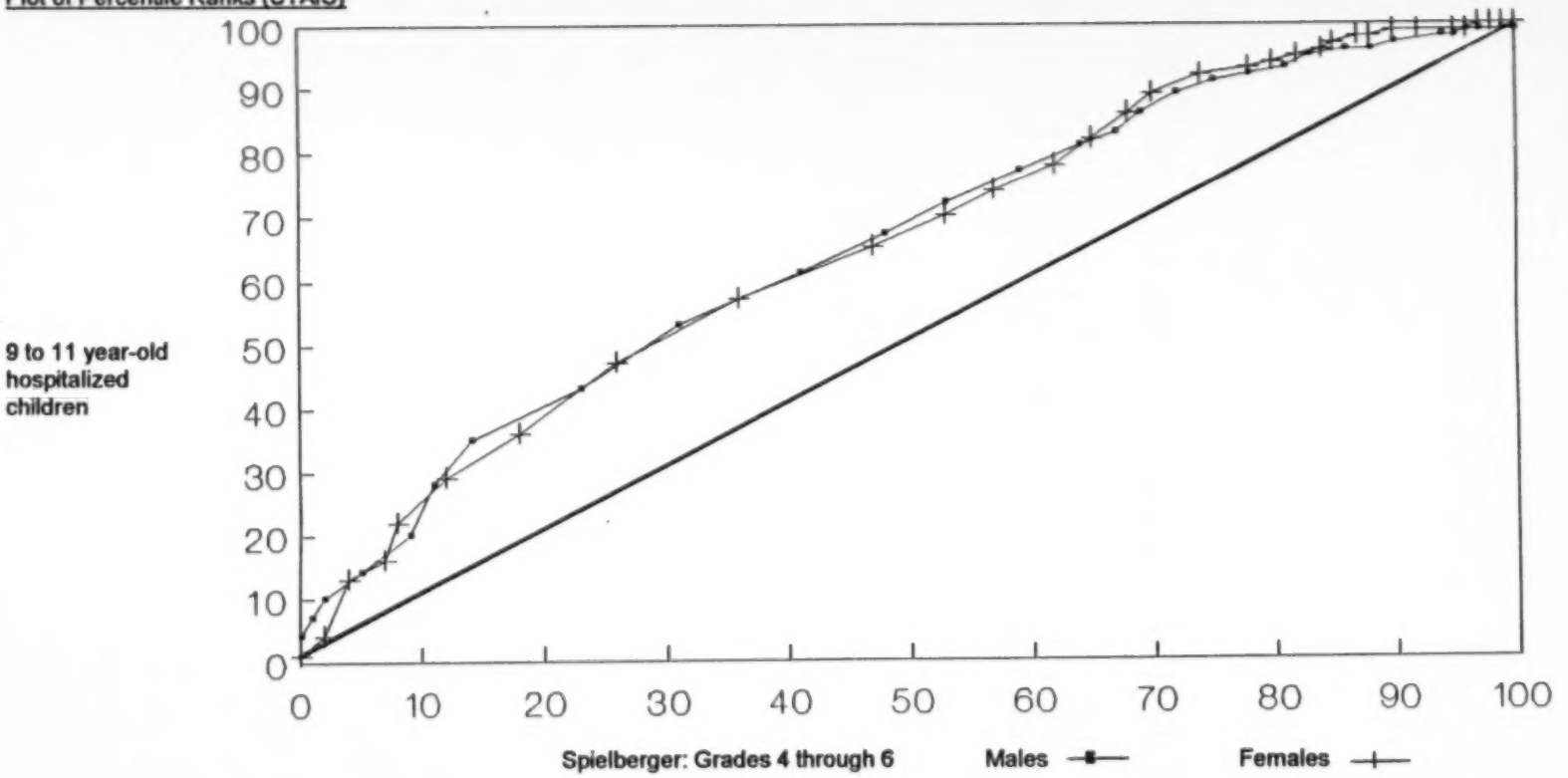
Comparison of Mean STAIC and STAIY Scores With Spielberger's

	Male			Female		
Subjects	M	(SD)	(n)	M	(SD)	(n)
STAIC						
Grade 4	30.1	(5.6)	(222)	30.3	(6.4)	(194)
9 years	**34.8**	**(7.3)**	**(34)**	**33.7**	**(7.4)**	**(55)**
Grade 5	31.0.	(5.6)	(286)	31.2	(6.1)	(250)
10 years	**34.3**	**(7.9)**	**(33)**	**34.9**	**(6.5)**	**(44)**
Grade 6	31.8	(5.8)	(309)	30.6	(5.6)	(293)
11 years	**33.9**	**(6.1)**	**(41)**	**36.1**	**(8.6)**	**(36)**
Grades 4 to 6	31.0	(5.7)	(817)	30.7	(6.0)	(737)
9 to 11 years	**34.3**	**(7.0)**	**(108)**	**34.9**	**(7.5)**	**(120)**
STAIY						
Grade 10	39.4	(9.7)	(202)	40.5	(12.9)	(222)
15 years	**38.5**	**(10.4)**	**(31)**	**39.1**	**(13.0)**	**(49)**

Note. Mean scores from this study are in bold face. Mean scores from Spielberger et al. (1973; 1983) are in regular font.

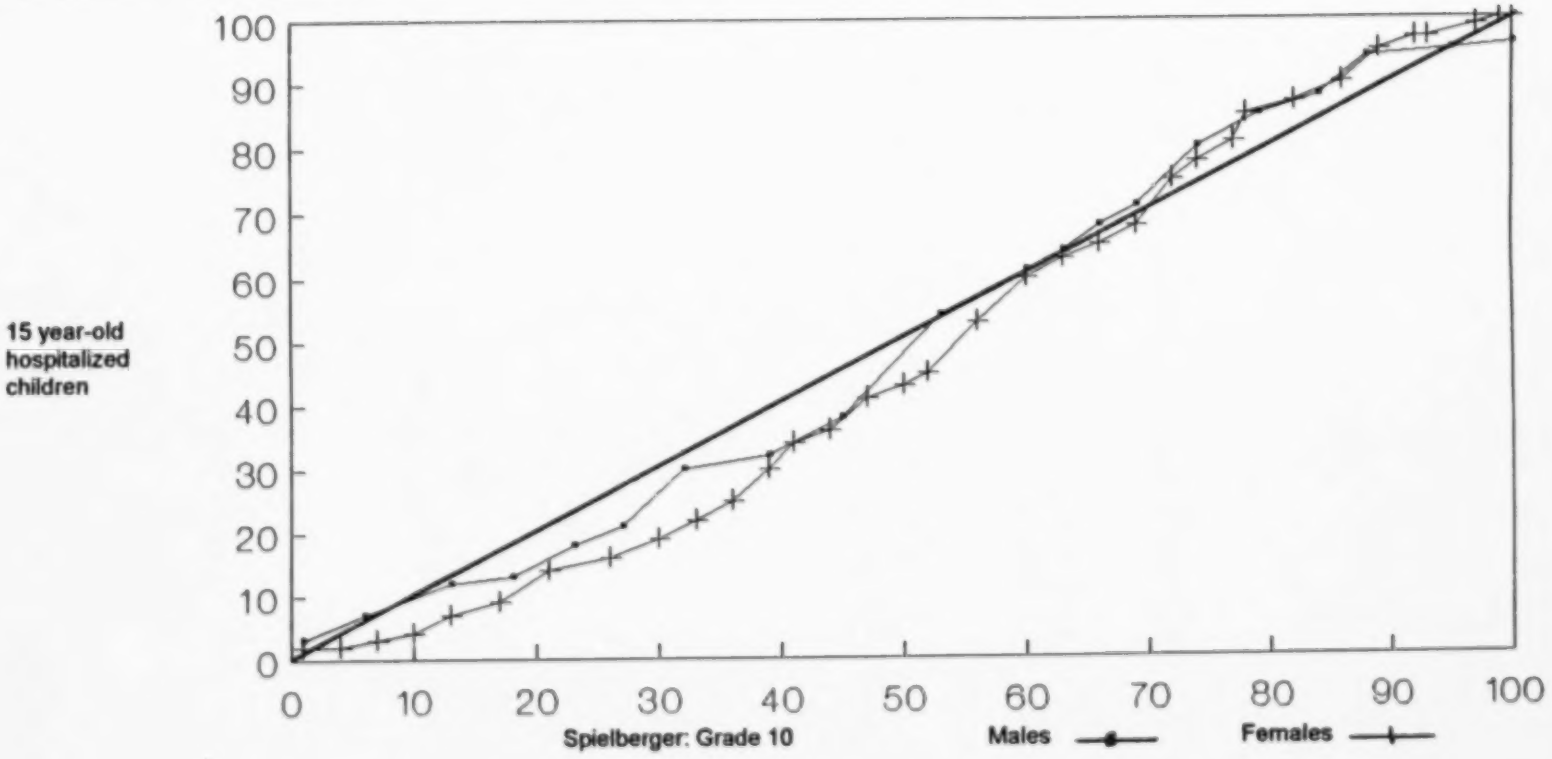
Figure 1

Plot of Percentile Ranks (STAIC)



Note. The diagonal line represents identical percentile ranks.

Figure 2
Plot of Percentile Ranks (STAIY)



Note. The diagonal line represents identical correlated percentile ranks.

(such as, vocabulary, and health status); low item variance; and invalidity of items.

The readability of the STAIY and STAIC was assessed by examining the items individually. Readability formulas which assign educational skill levels (such as grades) were not utilized as these are designed for assessment of continuous text and not short items as found on the STAIY and STAIC (Bruce & Rubin, 1988).

Syntax or idiom may have contributed to problems with some items. For example, the items *I feel sure* and *I feel satisfied* posed difficulties for many subjects. Usually one feels sure or satisfied about something particular, rather than at a point in time (as in, *At this moment I feel sure*). That many subjects asked "Sure about what?" and "Satisfied with what?" supports this contention. The item *I feel pleasant* provides another example. Pleasant is used in a syntactically unusual way, as an adverb to describe feelings and this may have confused readers.

A second explanation that may account for some item problems relates to the use of outdated words in items, words with which children may not have been familiar. Confirming outdated words is no easy task since current lists of word-use frequency are not available. However some words such as, Jittery, Strained, Steady, Content and Calm which were common when the STAIY and STAIC were developed several decades ago may now be outdated. The STAIY item *I am presently worrying about possible misfortunes* may also be outdated. It

has a formal, priggish tone that is not consistent with contemporary language. Moreover, the word Presently means soon, not currently.

A third explanation for problem items relates to readers' vocabularies. Subjects' vocabularies may have been limited, thus preventing them from reading or understanding the more unusual or complex words in items such as, Jittery, Terrified, and Indecisive. The finding that age was related to number of items omitted supports this notion. Jittery, which is included on both the STAIY and STAIC, was omitted by 3% of those who completed the STAIY versus 27% of those who completed the STAIC. Of course those completing the STAIY and STAIC are cohorts (having different experiences), but the breadth of their vocabularies can also be expected to be dissimilar.

A fourth explanation for poor items relates to subjects' health status. Some subjects who omitted more than eight STAIC or STAIY items had significant health problems, such as seizures or arthritis. The management of both diseases commonly requires the ingestion of drugs that can affect sensorium and may have affected their performance.

A fifth explanation considered in attempting to account for poor items was low item variance. However, as none of the STAIY or STAIC items in this study had particularly low variances this factor seems unlikely to be a source of problem items.

Invalid items could also account for the identified item problems. For example, the STAIY item *I feel confused* and STAIC items *I feel rested* and *I feel*

mixed-up do not have face validity as measures of state anxiety. None of these item words are listed In Roget's Thesaurus (1990) as synonyms of *anxiety* or *anxious.*

One of the objectives of this study was to evaluate reliability and validity of the STAIY and STAIC. Evidence supporting reliability was not strong. While computed alpha reliability coefficients were high the values are misleading as they are based on 60% of the subjects who completed the STAIC and 72% of those who completed the STAIY. As well, high frequencies of item omission and low corrected item-total and inter-item correlations call into question the internal consistency of the tools (and, therefore, their validity).

Limited support for the validity of the STAIC was found. Plots of percentile ranks indicated that as a group, children in hospital had higher anxiety than students. However, this evidence was outweighed by the issues of reliability previously discussed.

Evidence did not support the validity of the STAIY. With high STAIY scores, children in hospital had lower percentile rank values than students, as would be expected if the tool were valid. Sick children with low STAIY scores had higher percentile rank values than students. The latter unexpected finding suggests the STAIY may be sensitive to higher levels of anxiety but not to lower levels of anxiety. The explanation for these findings may rest with the unique, small sample of 15 year-olds in this study, and warrants further exploration.

In summary, the findings of this study do not support the reliability or

validity of the state anxiety forms of the STAIY or STAIC for use with children in hospital and/or undergoing invasive medical procedures. Furthermore, the identified item problems are likely to occur with children in other populations and settings. Re-evaluation of the tool particularly in light of readability is warranted. Finally, because the trait portions of the STAIY and STAIC were developed at the same time as the state portions of the tools these may be in need of re-evaluation as well.

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Appendix A

Table A1

Studies Providing Data: Purposes, Inclusion/Exclusion Criteria and Data Collected

	Aggregate		
Feature	I	II	III
Study purpose	To determine effectiveness of TENS in reducing postop pain	To determine effectiveness of EMLA in reducing needle pain	To determine effectiveness of TENS in reducing VP pain
Inclusion/exclusion criteria			
Common	Subject & guardian fluent in English		
	Subject & guardian consent		
	Subject comprehends VAS		
Unique	5 to 16 years of age	5 to 18 years of age	5 to 16 years of age
	Had appendectomy	Scheduled for VP/IV	Scheduled for VP
	To be in hospital next 2 days	No known allergies to EMLA	No experience with TENS
	No cardiac pacemaker		Both arms accessible
			No skin disorders
			VP to involve latex tourniquet
			VP to be in antecubital space

Table A1 (Continued)

Feature	Aggregate		
	I	II	III
Data collected (measures)			
From subject	State anxiety (STAIY or STAIC)	State anxiety (STAIY or STAIC)	State anxiety (STAIY or STAIC)
			Anxiety about VP (CAPS)
From parent	Subject date of birth, gender	Subject date of birth, gender, hospital environment	Subject age, gender
			Estimate of subject's anxiety with VP (CAPS)
			Own anxiety with VP (VAS)

Note. TENS = transelectrical nerve stimulation; EMLA = eutectic mixture of local anaesthetics; VP = venipuncture; IV = intravenous cannulation; STAIY = State-Trait Anxiety Inventory A-State, Form Y-1 (Spielberger et al., 1983); STAIC = State- Trait Anxiety Inventory, A-State, Form C-1 (Spielberger et al., 1973); CAPS = Child Anxiety and Pain Scale (Kuttner & LePage, 1989).

Appendix B

Table B1

STAIC and STAIY: Rank-ordering of Pearson Corrected Item-total Correlations

STAIC		STAIY	
Item	CITC	Item	CITC
Good	.64	Relaxed	.80
Happy	.61	At ease	.78
Worried	.61	Pleasant	.76
Scared	.60	Comfortable	.75
Frightened	.60	Calm	.72
Cheerful	.60	Frightened	.70
Troubled	.58	Content	.68
Relaxed	.58	Tense	.68
Bothered	.57	Nervous	.66
Upset	.57	Worried	.66
Nice	.56	Self confident	.66
Calm	.56	Secure	.66
Nervous	.54	Satisfied	.64
Jittery	.52	Steady	.59
Terrified	.50	Jittery	.57
Mixed up	.49	Upset	.52
Sure	.49	Strained	.51
Pleasant	.46	Worrying	.35
Rested	.43	Indecisive	.29
Satisfied	.36	Confused	.28
N	344		222

Note. All correlations were rounded to two digits.
$p < .05$.

Table B2

STAI-C: Pearson Inter-item Correlations of Less Than or Equal to .20

	Item					
Item	Rested	Satisfied	Pleasant	Calm	Nice	Sure
Frightened	.15**(512)	.14** (480)	.15** (492)			
Mixed up	.13**(515)	.10* (481)	.12** (495)	.17** (506)		
Terrified	.12**(508)	.10* (475)				
Nervous	.15**(512)	.09+ (478)	.19** (492)		.20**(511)	
Jittery	.15**(402)	.06+ (383)	.19** (394)		.19**(506)	
Worried	.15**(515)	.11* (481)				
Upset	.13**(515)	.19**(481)				.17**(503)
Scared	.18**(515)	.12* (481)				
Troubled	.18**(513)	.10* (479)				
Bothered	.17**(513)	.14**(480)				.20**(501)

Note. Number of cases is enclosed in brackets. All correlations were rounded to 2 digits.

+p > .05. *p < .05. **p < .01.

Table B3

STAIC: Pearson Inter-item Correlations

	Item No.								
Item No./Word	1	2	3	4	5	6	7	8	9
1. Calm									
2. Upset	.24 (506)								
3. Pleasant	.40 (484)	.29 (495)							
4. Nervous	.30 (503)	.39 (514)	.19 (492)						
5. Jittery	.27 (394)	.38 (404)	.19 (394)	.57 (402)					
6. Rested	.29 (504)	.13 (515)	.30 (493)	.15 (512)	.15 (402)				
7. Scared	.30 (506)	.52 (517)	.21 (495)	.58 (514)	.47 (404)	.18 (515)			
8. Relaxed	.47 (503)	.26 (514)	.40 (493)	.31 (511)	.31 (402)	.42 (512)	.35 (514)		
9. Worried	.38 (506)	.51 (517)	.24 (495)	.57 (514)	.48 (404)	.15 (515)	.61 (517)	.36 (514)	
10. Satisfied	.29 (470)	.19 (481)	.36 (462)	.09+ (478)	.06+ (383)	.39 (479)	.12* (481)	.35 (478)	.11* (481)

Note. Number of cases is enclosed in brackets. Only those item responses from subjects who omitted less than 3 items were included in the analyses. All correlations were rounded to 2 digits.
+$p > .05$. *$p < .05$. For all remaining correlations $p < .01$.

Table B3 (continued)

STAIC: Pearson Inter-item Correlations

	Item No.									
Item No./Word	1	2	3	4	5	6	7	8	9	10
11. Frightened	.37 (503)	.53 (514)	.15 (492)	.48 (511)	.42 (401)	.15 (512)	.65 (514)	.33 (511)	.66 (514)	.14 (480)
12. Happy	.40 (506)	.38 (517)	.48 (495)	.23 (514)	.27 (404)	.30 (515)	.28 (517)	.49 (514)	.34 (517)	.37 (481)
13. Sure	.37 (492)	.17 (503)	.34 (481)	.21 (500)	.25 (393)	.37 (501)	.23 (503)	.43 (500)	.25 (503	.33 (470)
14. Good	.48 (506)	.35 (517)	.49 (495)	.27 (514)	.28 (404)	.40 (515)	.32 (517)	.50 (514)	.34 (517)	.37 (481)
15. Troubled	.23 (504)	.51 (515)	.22 (493)	.38 (512)	.47 (403)	.18 (513)	.53 (515)	.32 (512)	.45 (515)	.10 * (479)
16. Bothered	.28 (504)	.52 (515)	.27 (493)	.42 (512)	.43 (402)	.17 (513)	.44 (515)	.32 (512)	.50 (515)	.14 (480)
17. Nice	.36 (503)	.27 (514)	.44 (492)	.20 (511)	.19 (401)	.36 (512)	.25 (514)	.41 (511)	.33 (514)	.35 (479)
18. Terrified	.22 (499)	.47 (510)	.21 (488)	.37 (507)	.34 (400)	.12 (508)	.56 (510)	.28 (507)	.48 (510)	.10 * (475)
19. Mixed up	.17 (506)	.48 (517)	.12 (495)	.41 (514)	.32 (404)	.13 (515)	.42 (517)	.22 (514)	.41 (517)	.10 * (481)
20. Cheerful	.40 (504)	.28 (515)	.50 (493)	.26 (512)	.27 (403)	.37 (513)	.31 (515)	.45 (512)	.29 (515)	.38 (479)

Note. Number of cases is enclosed in brackets. Only those item responses from subjects who omitted less than 3 items were included in the analyses. All correlations were rounded to 2 digits.
* $p < .05$. For all remaining correlations $p < .01$.

Table B3 (continued)

STAIC: Pearson Inter-item Correlations.

	Item No.								
Item No/Word	11	12	13	14	15	16	17	18	19
11. Frightened									
12. Happy	.35 (514)								
13. Sure	.24 (500)	.40 (503)							
14. Good	.34 (514)	.63 (517)	.44 (503)						
15. Troubled	.55 (512)	.32 (515)	.22 (501)	.31 (515)					
16. Bothered	.50 (512)	.37 (515)	.20 (501)	.33 (515)	.58 (513)				
17. Nice	.27 (511)	.56 (514)	.39 (500)	.56 (514)	.29 (512)	.33 (512)			
18. Terrified	.55 (507)	.28 (510)	.21 (496)	.23 (510)	.55 (508)	.51 (508)	.22 (507)		
19. Mixed up	.44 (514)	.26 (517)	.23 (503)	.27 (517)	.50 (515)	.45 (515)	.23 (514)	.42 (510)	
20. Cheerful	.24 (512)	.58 (515)	.38 (501)	.57 (515)	.28 (513)	.31 (513)	.52 (512)	.22 (508)	.22 (515)

Note . Number of cases is enclosed in brackets. Only those item responses from subjects who omitted less than 3 items were included in the analyses. All correlations were rounded to 2 digits.
$p < .01$.

Table B4

STAIY: Pearson Inter-item Correlations of Less Than or Equal to .20

	Item				
Item	Confused	Indecisive	Steady	Strained	Upset
Worrying	.19¯ (295)	.05⁺ (240)	.15* (287)	.19** (289)	
Secure	.17** (298)	.15* (243)			.20** (298)
Relaxed	.11* (296)	.16* (241)			
Satisfied	.09⁺ (294)	.18** (240)			
Tense	.14** (298)	.18** (243)			
Nervous	.18** (298)	.14* (243)			
Upset		.17** (243)			
At ease	.17** (296)				
Calm	.14* (298)				
Comfortable	.17** (298)				
Steady	.16** (290)				

Note. Number of cases is enclosed in brackets. All correlations were rounded to 2 digits.

⁺$p > .05$. * $p < .05$ ¯$p < .01$.

Table B5

STAIY: Pearson Inter-item Correlations

	Item No.								
Item No/Word	1	2	3	4	5	6	7	8	9
1. Calm									
2. Secure	.55 (298)								
3. Tense	.48 (298)	.40 (298)							
4. Strained	.28 (292)	.28 (292)	.41 (292)						
5. At ease	.66 (296)	.54 (296)	.52 (296)	.41 (290)					
6. Upset	.28 (298)	.20 (298)	.30 (298)	.42 (292)	.33 (296)				
7. Worrying	.24 (295)	.24 (295)	.29 (295)	.19 (289)	.23 (293)	.29 (295)			
8. Satisfied	.49 (294)	.44 (294)	.38 (294)	.22 (288)	.56 (292)	.29 (294)	.34 (391)		
9. Frightened	.53 (298)	.49 (298)	.51 (298)	.38 (292)	.52 (296)	.50 (298)	.30 (295)	.37 (294)	
10. Comfortable	.58 (298)	.53 (298)	.46 (298)	.37 (292)	.65 (296)	.30 (298)	.27 (295)	.61 (294)	.55 (298)

Note. Number of cases is enclosed in brackets. Only those item responses from subjects who omitted less than 3 items were included in the analyses. All correlations were rounded to 2 digits.
$p < .01$.

Table B5 (continued)

STAIY: Pearson Inter-item Correlations

	Item No.									
Item No./Word	1	2	3	4	5	6	7	8	9	10
11. Self confident	.51 (298)	.48 (298)	.37 (298)	.32 (292)	.59 (296)	.31 (298)	.29 (295)	.55 (294)	.42 (298)	.60 (298)
12. Nervous	.54 (298)	.49 * (298)	.54 (298)	.35 (292)	.52 (296)	.40 (298)	.26 (295)	.36 (294)	.67 (298)	.51 (298)
13. Jittery	.44 (294)	.37 (294)	.48 (294)	.34 (288)	.42 (292)	.25 (294)	.26 (292)	.24 (290)	.56 (294)	.43 (294)
14. Indecisive	.22 (243)	.15 * (243)	.18 (243)	.22 (240)	.24 (241)	.17 (243)	.05* (240)	.18 (240)	.22 (243)	.22 (243)
15. Relaxed	.66 (296)	.55 (296)	.57 (296)	.37 (290)	.67 (294)	.36 (296)	.33 (293)	.58 (292)	.52 (296)	.71 (296)
16. Content	.49 (291)	.44 (291)	.43 (291)	.29 (286)	.60 (289)	.33 (291)	.25 (288)	.55 (287)	.43 (291)	.55 (291)
17. Worried	.44 (297)	.38 (297)	.52 (297)	.37 (291)	.49 (295)	.44 (297)	.42 (294)	.40 (293)	.67 (297)	.47 (297)
18. Confused	.14 * (298)	.12 (298)	.14 (298)	.25 (292)	.17 (296)	.24 (298)	.19 (295)	.09* (294)	.28 (298)	.17 (298)
19. Steady	.50 (290)	.45 (290)	.38 (290)	.31 (284)	.56 (288)	.21 (290)	.15 (287)	.53 (286)	.35 (290)	.59 (290)
20. Pleasant	.55 (298)	.50 (298)	.49 (298)	.39 (292)	.62 (296)	.29 (298)	.30 (295)	.64 (294)	.42 (298)	.64 (298)

Note. Number of cases is enclosed in brackets. Only those item responses from subjects who omitted less than 3 items were included in the analyses. All correlations were rounded to 2 digits.
*$p > .05$. * $p < .05$. For all remaining correlations $p < .01$.

Table B5 (continued)

STAIY: Pearson Inter-item Correlations

	Item No.								
Item No/Word	11	12	13	14	15	16	17	18	19
11. Self confident									
12. Nervous	.39 (298)								
13. Jittery	.30 (294)	.57 (294)							
14. Indecisive	.22 (243)	.14 * (243)	.25 (241)						
15. Relaxed	.54 (296)	.61 (296)	.47 (292)	.16 * (241)					
16. Content	.45 (291)	.43 (291)	.37 (287)	.21 (240)	.60 (289)				
17. Worried	.39 (297)	.60 (297)	.51 (293)	.18 (242)	.54 (295)	.44 (290)			
18. Confused	.25 (298)	.18 (298)	.26 (294)	.24 (243)	.11 * (296)	.21 (291)	.31 (297)		
19. Steady	.49 (290)	.32 (290)	.29 (286)	.21 (239)	.55 (288)	.48 (283)	.32 (289)	.16 (290)	
20. Pleasant	.59 (298)	.49 (298)	.41 (294)	.21 (243)	.67 (296)	.58 (291)	.47 (297)	.23 (298)	.59 (290)

Note. Number of cases is enclosed in brackets. Only those item responses from subjects who omitted less than 3 items were included in the analyses. All correlations were rounded to 2 digits.
*$p > .05$. °$p < .05$. For all remaining correlations $p < .01$.

Table B6

STAIC and STAIY: Problem Items Identified on the Basis of High Omission and/or Low Corrected Item-total or Inter-item correlations.

Item	Criterion		
	Omission Rate	CITC ≤ .50	Frequency involved in inter-item $r \leq .20$
STAIC			
Jittery	27.6	—	4
Satisfied	13.6	.37	10
Pleasant	9.4	.46	4
Terrified	6.5	.50	2
Sure	6.1	.49	2
Calm	5.1	—	1
Rested	—	.43	10
Mixed up	—	.49	4
STAIY			
Indecisive	20.7	.29	7
Content	4.5	—	—
Strained	3.9	—	1
Steady	3.9	—	2
Confused	—	.28	10
Worrying	—	.35	4

Note. CITC = corrected item total correlation.

Table B7

Comparison of STAIC Percentile Ranks With Spielberger et al's. (1973)

	Study			
	Spielberger's Grades 4 through 6		This study 9 through 11 years	
Rawscore	Male	Female	Male	Female
				0
20	1	1		
21	2	3		
22	4	4	0	2
23	7	7	1	
24	10	9	2	
25	14	13	5	4
26	20	16	9	7
27	28	22	11	8
28	35	29	14	12
29	43	36	23	18
30	53	47	31	26
31	61	57	41	36
32	67	65	48	47
33	72	70	53	53
34	77	74	59	57
35	81	78	64	62
36	83	82	67	65
37	86	86	69	68
38	89	89	72	70
39	91	92	75	74
40	94	93	78	78
41	93	94	81	80

Table B7 (Continued)

Comparison of STAIC Percentile Ranks With Spielberger et al's. (1973)

	Study			
	Spielberger's Grades 4 through 6		This study 9 through 11 years	
Rawscore	Male	Female	Male	Female
42	95	95	83	82
43	96	96	86	84
44	96	97	88	85
45	97	98	90	87
46	98	98	90	88
47	98	99	94	90
48	98	99	95	92
49				94
50	99	99		95
51	99	99	96	96
52	99	100	97	97
53	99	100	99	98
54	99	100	100	
55	99	100		99
56	100	100		100
57	100			
58	100			
59	100			
60				
n	817	737	108	120

Table B8

Comparison of STAIY Percentile Ranks With Spielberger et al.'s, (1983)

	Study			
	Spielberger's Grade 10		This study 15 years	
Rawscore	Male	Female	Male	Female
20	2	2		1
21	2	2		4
22	3	3	1	7
23	5	4		10
24	7	6	6	
25	8	7		13
26	10	9		17
27	12	11	13	
28	13	14	18	21
29	15	16		26
30	18	19	23	30
31	21	22	27	33
32	26	25		36
33	30	30	32	39
34	32	34	39	41
35	38	36	45	44
36	41	41		47
37	44	43		50
38	48	45		52
39	54	47	53	
40	56	53		56
41	59	56		

Table B8 (Continued)

Comparison of STAIY Percentile Ranks Spielberger et al.'s. (1983)

	Study			
	Spielberger's Grade 10		This study 15 years	
Rawscore	Male	Female	Male	Female
42	61	60	60	60
43	64	63	63	63
44	68	65	66	66
45	71	68	69	69
46	76	71		
47	80	75	74	72
48	81	78		74
49	85	81	79	77
50	88	85	84	78
51	92	87		82
52	92	88		
53	93	90		86
54	94	92	88	
55	95	94	95	
56	96	95	100	89
57	97	96		
58	98	97		
59	98	97		92
60	98	97		93
61	99	98		
62	99	98		
63	99	98		

Table B8 (Continued)

Comparison of STAIY Percentile Ranks With Spielberger et al.'s, (1983)

	Study			
	Spielberger's Grade 10		This study !5 years	
Rawscore	Male	Female	Male	Female
64	99	98		
65	99	98		
66	99	98		
67	100	99		
68	100	99		97
69	100	99		
70	100	99		
71	100	99		
72	100	100		
73	100	100		99
74	100	100		100
75	100	100		
76	100	100		
77	100	100		
78	100	100		
79	100	100		
80	100	100		
n	202	222	31	49